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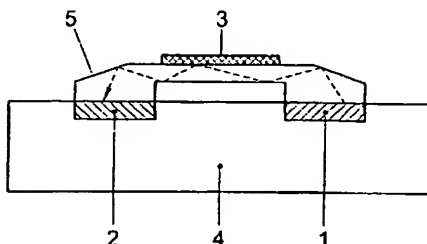
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(54) Title: LIGHT EMITTING DIODE



(57) Abstract: The invention relates to a light emitting diode having at least one (semi)conductive electroluminescent active layer which comprises at least two different electroluminescent functionalities, wherein the emission spectrum of the diode exhibits at least two intensity maxima. The invention further relates to a detector which comprises a light emitting diode which is capable of emitting light at least two mutually separate intensity maxima.

WO 2005/001945 A3

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H01L51/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01L G01N G01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ZHANG CHI ET AL: "Gallium nitride/conjugated polymer hybrid light emitting diodes: Performance and lifetime" JOURNAL OF APPLIED PHYSICS, AMERICAN INSTITUTE OF PHYSICS. NEW YORK, US, vol. 84, no. 3, 1 August 1998 (1998-08-01), pages 1579-1582, XP012045635 ISSN: 0021-8979 page 1579, left-hand column page 1580, left-hand column, paragraph 3; figure 3a page 1581, left-hand column	1-4, 7, 9-12
Y	----- -/-	18

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 6127693	A	03-10-2000	NONE		
JP 07030148	A	31-01-1995	NONE		
US 6331438	B1	18-12-2001	AU	2725001 A	04-06-2001
			EP	1171764 A1	16-01-2002
			JP	2003515163 T	22-04-2003
			WO	0138857 A1	31-05-2001
US 5307146	A	26-04-1994	CA	2116786 C	22-07-1997
			EP	0604582 A1	06-07-1994
			JP	6511082 T	08-12-1994
			WO	9306459 A1	01-04-1993